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Invited Lecture

A PROSPECTIVE STUDY ON USING MACHINE LEARNING FROM SPECTROSCOPIC DATA FOR PLASMA PARAMETER PREDICTIONS

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This work deals with machine learning, especially the use of Python sickit-learn package to build predictive models. Sickit-learn is widely used in data science and artificial intelligence. It is focused on spectroscopic data of hydrogen isotopes or impurities from tokamaks combined with independent diagnostic systems, aiming to predict plasma parameters or isotopic ratios. The work is inspired by the very recent application of machine learning to predict plasma parameters in linear devices like PISCES-B or NAGDIS where neutral helium lines were used (Nishijima et al. 2021) to predict electron density and temperature. A line intensity ratio dataset of about 9 neutral helium lines where used as input data in a support vector machine regression analysis of a machine learning to predict n_e and T_e values which are validated by comparison with n_e and T_e deduced from an independent diagnostic technique like Langmuir probe in Nishijima et al. (2021) or Thomson scattering. Usually, He I line ratios are used in combination with collisional-radiative modeling to get the electron density and temperature since some lines are sensitive to the electron density and others to the electron temperature (Kajita et al. 2020). In this prospective work, It is proposed to use a similar method by considering some major line characteristics like line width, peak positions, line dips, intensities and some other features (shoulders) depending on the available data. The data will be split in a train set and a test set to build an appropriate regression fitting analysis allowing to predict results which will be confronted to the test data set before its use for further predictions. Applications to tokamak plasmas is foreseen in a further step of this work.

References

Kajita, S. et al.: 2020, *AIP Advances*, **10**, 025225.
Nishijima, D. et al.: 2021, *Rev. Sci. Instrum.*, **92**, 023505.